[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the low power driving circuit and drive method of a liquid crystal display.
[0002]
[Description of the Prior Art]Generally, a liquid crystal display is used for various products containing a portable game machine and a notebook sized personal computer. The liquid crystal stores dept. which stores data in the crossing of the row and column of the panel of this liquid crystal display is arranged. And various colors including black and white appear with the voltage which the panel of a liquid crystal display requires for both ends. That is, the image of the screen displayed is adjusted by activating the gate line which chooses the line of a display and supplying regulation voltage to each sequence of the selected line through a source driver. In order to prevent the phenomenon in which a liquid crystal moves only to one way and the life of a panel is shortened at this time, positive voltage and negative voltage carry out the police box of the polarity of the signal impressed to the both ends of the panel of a liquid crystal display, and it is impressed.
[0003]A double-sided voltage adjustment system and a whole surface voltage adjustment system are one of the systems which impress voltage to the both ends of the conventional liquid crystal panel. A double-sided voltage adjustment system is a system with which it changes simultaneously and double-sided voltage drives a liquid crystal panel, as shown in drawing 1. That is, when a double-sided voltage adjustment system will become white if the voltage difference of the whole surface displayed by a dotted line and other whole surface displayed as a solid line becomes the minimum (a, b section), and it becomes the maximum, it is a system designed become black (c, d, e section). The moment such a double-sided voltage adjustment system changes from c of drawing 1 to e from d or d, when all the voltage between both ends changes, each change of potential impressed to both ends is carried out in the small range. However, in order that the voltage impressed to the field which becomes a standard of a liquid crystal panel in this case may also move continuously, the design difficulty of image quality and a drive module exists.
[0004]On the other hand, as a whole surface voltage adjustment system is shown in drawing 2, the voltage of the base level displayed as a solid line is a system to which only the voltage of the strange pressure surface which fixes and is displayed by a dotted line is changed. Such a whole surface voltage adjustment system changes only a sheet of voltage from c of drawing 2 at the moment of changing from d or d to e. Although the whole surface voltage adjustment system is the mainstream among this whole surface voltage adjustment system and said double-sided voltage adjustment system, this is because the whole surface voltage adjustment system is good in respect of the image quality of a screen.
[0005]
[Problem to be solved by the invention]However, for every pixel and line, positive voltage and negative voltage carry out the police box of the whole surface voltage adjustment system, and it appears. That is, when the greatest voltage should be continuously supplied to the both ends of a liquid crystal panel through the same source driver, the range of voltage conversion becomes very large. That is, since the voltage of a base level is constant, in the present frame, the voltage outputted through a source driver turns into the maximum voltage in a positive direction, and turns into the maximum voltage with the following frame in a negative direction. Thus, when change of the output voltage in the same source driver is large, the problem that the electric

power exhausted since an output driver is driven every when a frame changes, and the setting time taken to reach the output level which carries out the purpose become large occurs.
[0006]The purpose of this invention is to provide a low power driving circuit and a drive method which minimize setting time which to minimize power consumption generated when a frame changes, and is taken for an output to be stable.
[0007]
[Means for solving problem]As for this invention, a low power driving circuit of this invention is characterized by that a drive circuit of a liquid crystal display which has a liquid crystal stores dept. arranged by a series of lines driven with each gate line and a series of sequences which supply an electric charge to a display with each source line comprises the following.
A gate line of at least one auxiliary line which answers a preliminary scanning signal and is not chosen now.
A gate actuator which generates a gating signal to which the disable of the gate line of said auxiliary line is carried out while a gate line of a line chosen is being activated, after activating a gate line of a line chosen simultaneously.
A source actuator which generates a source signal which supplies an electric charge with said source line after intercepting data supply to said source line and carrying out the disable of the gate line of said auxiliary line, while answering said preliminary scanning signal and activating simultaneously a gate line and said gate line chosen of said auxiliary line.

[0008]In this low power driving circuit, said gate actuator, When a line which this corresponds when a corresponding line is specified is activated and other at least one line is desirably specified by a predetermined line selection signal and said preliminary scanning signal, After activating said corresponding line temporarily, two or more gate sections which output respectively a gating signal deactivated again are provided.
[0009]And the 1st sifting section to which said gate section answers said line selection signal, and chooses the gate line of said specified line as, and the address of a line specified continuously is made to increase, After answering said preliminary scanning signal and the output signal of said 1st sifting section and choosing the gate line of the line of the next address of the output signal of said 1st sifting section, While the gate line of said 1st sifting section output signal is chosen, it has the 2nd sifting section that generates the output signal which inactivates said following gate line again, and an OR gate which makes an input signal the output signal of said 1st sifting section, and the output signal of said 2nd sifting section.
[0010]As for this invention, the low-electric-power drive method of this invention is characterized by that the drive method of the liquid crystal display which has a liquid crystal stores dept. arranged by a series of lines driven with each gate line and a series of sequences which supply an electric charge to a display with each source line comprises the following.
A) Intercept supply of the electric charge to said source line, and the gate line of a line and the gate line of an auxiliary line which are chosen in the state are activated altogether temporarily, The stage of making the data of a liquid crystal stores dept. connected with the data of a liquid crystal stores dept. connected with the gate line of said line chosen, and the gate line of said auxiliary line generating an electric charge share through said source line.
B) The stage which carries out the disable of the gate line of said auxiliary line while the gate line of said line chosen maintains an activated state.
C) The stage which supplies an electric charge to the liquid crystal stores dept. connected with the gate line of said line chosen.

[0011]In this low-electric-power drive method, A stage desirably, A1 -- the stage which intercepts supply of the electric charge to said source line, and A2 -- with the stage which activates temporarily said gate line of the line chosen, and the gate line of an auxiliary line altogether. A3) The stage of making the data of a liquid crystal stores dept. connected with the gate line of said line chosen and the data of a liquid crystal stores dept. connected with the gate line of said auxiliary line generating an electric charge share through said source line is provided.
[0012]According to the low power driving circuit and drive method of above this inventions, the setting time which to minimize the power consumption generated when a frame changes using an electric charge share phenomenon, and is taken for an output to be stable can be minimized.
[0013]
[Mode for carrying out the invention]Hereafter, with reference to the attached Drawings, the desirable embodiment of this invention is described in detail. However, an embodiment is only a mere example, and if it is those who have the usual knowledge of this technical field, it cannot be overemphasized that modification and other equal embodiments more various than this are possible. Therefore, the true technical scope of protection of this invention should be decided by the technical idea of Claims.
[0014]drawing 3 is a circuit diagram showing roughly the embodiment of the low power driving circuit of this invention containing the panel of the liquid crystal display which consists of a sequence of N lines and M individuals. When this is referred to, the low power driving circuit of an embodiment of the invention, Liquid crystal stores dept. C11 arranged by the N gate lines G1, G2, G_3, --, the line chosen by GN, and the M source lines S1, S2, S_3, -- and the sequence chosen by SM, C_{12}, --, the image of the liquid crystal display which has CNM are driven. Here, the panel 10 of a liquid crystal display is driven with the whole surface voltage adjustment system mentioned above. Therefore, positive voltage and negative voltage carry out a police box to the whole surface of the liquid crystal stores dept. of each line arranged by the same sequence, and are impressed to it.
[0015]The low power driving circuit of an embodiment of the invention possesses the gate actuator 11, the source actuator 13, and the preliminary scanning signal generator 15. The preliminary scanning signal generator 15 answers the external control signal VCON, and generates the preliminary scanning signal PRESCAN. And the preliminary scanning signal PRESCAN is inputted into the gate actuator 11 and the source actuator 13.
[0016]The gate actuator 11 activates a gate line by the preliminary scanning signal PRESCAN. Two gate lines are activated at this time. One is a gate line chosen by the row address, and other one is one among the gate line which is not chosen. For convenience, on these Descriptions, at least one gate line activated among the gate lines which are not chosen is called gate line of an auxiliary line. In this embodiment, when the gate line G1 is chosen, suppose that the gate line G2 of an auxiliary line is chosen. Then, if the gate line G1 is chosen and it is activated with said preliminary scanning signal PRESCAN, the gate line G2 of an auxiliary line will also be activated. Then, said gate line G1 and while being activated, the gate line G2 of an auxiliary line is inactivated. Selection of such a line is effectively carried out also by the following clock signal. That is, the gate line G2 chosen is activated with the following clock. After the gate line of an auxiliary line is activated with the gate line G2 as G3 at this time, while the gate line G2 is being activated, gate line G3 of an auxiliary line inactivates. Activation of such a line appears one by one in a gate line with a continuous clock signal.
[0017]The source actuator 13 answers said preliminary scanning signal PRESCAN, and provides

said source line S1, S2, S3, --, the liquid crystal stores dept. on a liquid crystal display chosen with data through SM. The gate line chosen is G1 for convenience, and it is as follows when said source actuator 13 is explained by making into an example the case where the gate line G2 is chosen as a gate line of an auxiliary line.

[0018]While said gate line G1 and the gate line G2 of said auxiliary line are chosen, the data supply to said source line S1, S2, S3, --, SM is intercepted. Then, an electric charge share phenomenon generates the data of a liquid crystal stores dept. connected with the gate line G1 and the gate line G2, being arranged by the same sequence. That is, the data of the liquid crystal stores dept. C11 and the liquid crystal stores dept. C21 becomes average value by an electric charge share phenomenon. Then, after the gate line G2 of said auxiliary line inactivates, data is inputted into the liquid crystal stores dept. C11 through said source line S1.

[0019]Drawing 6 is a wave form chart showing the driving timing of the above gate lines, and operation of a source line as compared with the former. If this is referred to, after the gate line G2 is activated temporarily in the section which the gate line G1 is chosen first and activated, by an embodiment of the invention, it will inactivate again. Next, after gate line G3 is activated temporarily in the section which the gate line G2 is chosen and is activated, it inactivates again. After an extraordinary auxiliary gate line is activated temporarily in the section which such operation is repeated, and GN of the last gate line is chosen, and is activated, it inactivates again.

[0020]Therefore, although a dotted line shows operation of a source line by conventional technology in a comparison figure portion of drawing 6 and a solid line shows operation of a source line by a low power driving circuit of an embodiment of the invention, according to this invention (solid line), since b section when a gate line chosen and a gate line of an auxiliary line are activated simultaneously at, and an electric charge share occurs comes to exist in between when voltage changes, for example from a section of drawing 6 at c section, as compared with conventional technology (dotted line), voltage change of a source line is boiled markedly and decreases. And when voltage change decreases in this way, while being able to minimize power consumption generated when a frame changes according to this invention, setting time taken for an output to be stable can be minimized.

[0021]Drawing 4 is a block diagram showing one example of the gate actuator 11 of drawing 3. If this is referred to, the gate actuator 11 possesses two or more gate sections 17. The gate section 17 inputs line select data RSEL and the preliminary scanning signal PRESCAN, and outputs a gating signal to the gate line G1, G2, G3, --, a gate line corresponding among GN(s). At this time, a corresponding gate line is activated, when a corresponding line is specified. When other at least one line is specified this gate line, after being activated temporarily, it is inactivated again.

[0022]The gate section 17 specifically possesses the 1st sifting section 19, the 2nd sifting section 21, and OR gate 23. The 1st sifting section 19 chooses a gate line of a line which answered line select data RSEL and was specified as it. And an address of a line which answers an external clock signal (not shown) and is specified as it is made to increase. The 2nd sifting section 21 answers output signal SHIFT1 of the preliminary scanning signal PRESCAN and said 1st sifting section 19, and chooses a gate line of a line of the next address of output signal SHIFT1 of said 1st sifting section 19. For example, when output signal SHIFT1 of said 1st sifting section 19 chooses the gate line G1 and it is activated, output signal SHIFT2 of said 2nd sifting section 21 chooses the gate line G2, and it is activated. Then, output signal SHIFT2 of said 2nd sifting section 21 is again inactivated, while output signal SHIFT1 of said 1st sifting section 19 is being activated.

[0023]OR gate 23 inputs output signal SHIFT1 of said 1st sifting section 19, and output signal

SHIFT2 of said 2nd sifting section 21, and carries out OR operation. The gate section 17 possesses further the buffer 25 which outputs desirably a gating signal which buffers the output signal N24 of said OR gate 23, and corresponds.

[0024]Drawing 5 is a block diagram showing one example of the source actuator 13 of drawing 3. If this is referred to, the source actuator 13 possesses two or more sourcing parts 31. The sourcing part 31 answers the preliminary scanning signal PRESCAN, and while a gate line of an auxiliary line and a gate line chosen are being activated simultaneously, it intercepts data supply to a source line. Then, the sourcing part 31 supplies an electric charge (source signal) to each corresponding liquid crystal stores dept. connected with said gate line chosen through a source line, after the disable of the gate line of an auxiliary line is carried out.

[0025]The sourcing part 31 specifically possesses the data generating part 33 and the switch 35. The data generating part 33 chooses the data VDAT inputted by R-G-B of the data selection signal VGAMMA and a data signal through each source line, and is generated. The switch 35 answers the preliminary scanning signal PRESCAN, and while the gate line and said gate line chosen of said auxiliary line are being activated simultaneously, it intercepts supply of said data VDAT to said source line. Then, said switch 35 supplies said data VDAT to said source line, after the disable of the gate line of said auxiliary line is carried out.

[0026]The data generating part 33 specifically possesses the latch part 37, the selecting part 39, and the amplifier 41. The latch part 37 latches R-G-B of the data signal inputted from the outside. The selecting part 39 chooses the data VLAT which answered the predetermined external selection signal VGAMMA and was latched by said latch part 37. The amplifier 41 amplifies the data VSEL with said selected selecting part 39, and outputs the amplified data VDAT to said switch 35.

[0027]

[Effect of the Invention]As explained to details above, according to the low power driving circuit and drive method of this invention. using an electric charge share phenomenon, voltage change of a source line can be boiled markedly and can be decreased, and while being able to minimize the power consumption generated when a frame changes as a result, the setting time taken for an output to be stable can be minimized.